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ANALYSIS OF AIR QUALITY FOR ENVIRONMENTAL MANAGEMENT: A MODEL STUDY FROM TALANGANA STATE

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ABSTRACT

Air quality has been impacted due to Urbanization and Industrialization air pollution has been increased in this connection this study area has been carried out on Air quality parameters such as suspended particulate matter, respirable particular matter ,oxides of sulphur, oxides of nitrogen, oxides of carbon at six stations around kothagudem which are Korukonda Ramavaram, B power house, Upparagudem, SCCL colony, Sarvaram village, Hemachandrapuram as there is a proposal for extension of Thermal power plant in that region. Air quality parameters are measured by gravimetric analysis by high volume air samplers to generate Baseline data for the proposed project. The baseline environment quality represents the background environmental scenario of various environmental components during the study period. The baseline quality monitored reflects the environment status from the existing activities and other local activities within 10 km radius of the study area. In this study we has been identified that the maximum values of air quality parameters are obtained in 'B' Power House

Key words: Air Quality Parameters, Gravimetric Analysis.

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1. INTRODUCTION

The quality of air pollutants is influenced by the movement and characteristics of the air mass into which they are emitted. If the air is calm and pollutants cannot disperse then the concentration of these pollutants will build up. Conversely, if a strong, turbulent wind is blowing any pollution generated will be rapidly dispersed into the atmosphere and will result in lower concentrations near the pollution source. The measurements of wind speed and direction, temperature, humidity, rainfall and solar radiation are important parameters used in the study of air quality monitoring results and to further understand the chemical reactions that occur in the atmosphere. Meteorological monitoring is used to predict air pollution events such as inversions, high pollutant concentration days and to simulate and predict air quality using computer models. When the likely source or sources have been identified they can then be managed to reduce the impacts on air quality. The measurement of meteorological parameters is important to gain an understanding of the impacts of a region's meteorology on air pollutant concentrations, the prediction of inversions, and for the study of wind field and dispersion modelling.

1.1. DESCRIPTION OF STUDY AREA

1.2. TOPOGRAPHY

The study area is located at Khammam district in Telangana state. The area is covered in part of survey of India Topographical sheet Nos. 65 C/6, 7, 10 and 11. The study area is well connected to kothagudem (5km) and the Khammam (80km), the district head quarters by the state highways. The study area is parts of the district are mainly hilly, Godavari, Tungabhadra and Khammam has the largest area under forests.

1.3. Rainfall and temperature

Study area has a tropical climate. The summer here have a good deal of rainfall while the winters have very little. The average annual temperature is 28.1°c.precipitation here averages 1046 mm. The difference in precipitation between the driest month and the wettest month is 281 mm .throughout the year ,temperatures vary by 112°c.the diversity of the physical features results in a corresponding diversity of climate.

2. OBJECTIVES

- Collection of the Air sample's and analysis.
- To estimate the impact on air quality in proposed site.

3. METHODOLOGY

3.1. AMBIENT AIR QUALITY

In order to identify the background air quality data and also to represent the interference from various industrial and local activities, screening techniques have been used for identification of air quality stations in the study areas. There are no sensitive areas with the study area.

3.2. Identification of various industrial operations in the study area

The following activities are present in the 10 Km radius of the proposed power plant, which are responsible for the background air quality.

- Existing Power Plants.
- Coal transport from the mines to KTPS.
- Metalled and dry road conditions

3.3. Description of equipment used in Air Quality monitoring

The air quality monitoring was done with the Respirable Dust Sampler APM 460 BL

Table 1 The specifications of APM 460 BL

Flow Rate	**:**	**0.9-1.4 m^3/min. (Free Flow condition without filter)**
Particle Size	:	A cyclone is used for fractionating the dust into two fractions. D-50 for the cyclone is at 10 microns. PM dust is accumulated on the filter paper (8"× 10" size) while coarse dust is collected in a cup placed under the cyclone.
Recommended filter	:	Whatman GF/A for common and Whatman's type No. EPM 2000 for special research.
Sampling Time	:	28 hours (Maximum)
Sampling Time Record	:	0 to 9999.99 hours
Automatic sampling control	:	24 hrs, a programmable Digital Timer is used to shut off the sampler after a preset sampling interval.
Power Requirements	:	Nominal, 22V, Single phase, 50-Hz AC mains supply.
Overall size	:	Approximately 430×320×930mm.
Weight	:	42 Kg.

The Respirable Dust Standard by the Central Pollution Control Board recommends a 10micron cut-off size for respirable dust measurements. The cyclone of the APM 460 BL Respirable Dust Sampler has been designed to provide a cut-off at 10 microns for particulate commonly found in the urban environment.

3.3.1. Flow measurement in the APM 460 BL sampler

The APM 460 BL respirable Dust Sampler uses proven Orifice Plate based Flow Metering System. The Orifice Plate is built into the body of the Filter Adaptor Assembly and there are no joints or leakage paths between the Orifice Plate and the filter. The pressure drop across the orifice is measured by a Manometer, in which the scale is calibrated in units of flow (m^3/min). Comparable dust concentration within acceptable ± 10%.The gaseous sampling attachment APM 411 with the Respirable Dust Sampler is essentially a particulate sampling system requiring a high flow rate. Gaseous sampling requires only a few LPMN of airflow. All models of Envirotech Respirable Dust Samplers are provided with a suction port and mounting hardware to facilitate interface of a Gaseous Sampling Attachment APM 411.

Specifications

Flow Rate	0.3 to 3 LPM ± 2% accuracy on span.
Flow control	4 inlet and 1 outlet with needle valves for flow control.
Sampling Train	4 Nos. of 35 ml Borosilicate midget glass impingers.
Size\Weight	240×125×350mm, 2kg.

Flow rate reading indicated by calibrator and instrument is comparable within ±5% accuracy.

3.4. Ambient Air Quality Data

The quality of air was surveyed with in 10 km radius from project site. The ambient air quality survey covers Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NO_X) were done in the areas within the core zone and in the adjoining villages (buffer zone) for the summer season, 2016 covering the months April, May, and June**.** The 24 hourly averaged air-sampled data for one season were represented in Table 3 respectively. Graphical trend analyses of all the air sampling stations are shown in figure 2. The summary of seasonal data for all stations is given in Table: 4.0

3.5 Identification of Ambient air Quality Monitoring Stations:

Ambient air quality of the study area has been assessed through a network of 6 stations. These stations are designed keeping in view of the climatologically conditions of the study region.

The air sampling station's location of the study area are shown In **Fig-1** The sampling details are given below in **Table: 2**

Table 2 Ambient Air Quality Monitoring Stations

Station	Code	Distance from the Plan site(km)	Direction wrt Plant site
Power house	A-1	-	-
SCCL Colony	A-2	-	-
Hemachandrapuram Village	A-3	1.6	NNE
Sarvaram Village	A-4	1.7	SSW
Korukondaramavaram Village	A-5	2.5	WNW
Upperagudem Village	A-6	2.9	WSW

The above monitoring stations are located such that a representative background ambient air quality levels are obtained. Pre calibrated respirable dust samplers were used for monitoring of the existing AAQ status. Methodologies adopted for sampling and analysis are as per the approved methods of Central Pollution Control Board (CPCB). Data on the activities surrounding the ambient air quality monitoring stations were collected for interpretation of the ambient air quality status.

4. RESULTS AND DISCUSSION

4.1 Results of the ambient air quality at all the above locations were found to be well within the limits of National Ambient Air Quality (NAAQ) standards specified for Residential and industrial areas. Concentrations of SPM, RPM, SO_2 and NOx are mainly contributed due to

vehicular traffic and local activities. The 24 hourly ambient air quality data monitored at all the six locations is furnished in tables 6.0 –6.5. and the mineralogical composition of RPM collected in project site shown Maximum level of Silica shown in the samples of Sarvaram and Hemachandrapuram.

Table 3. Mineralogical Composition of RPM Collected at Study area

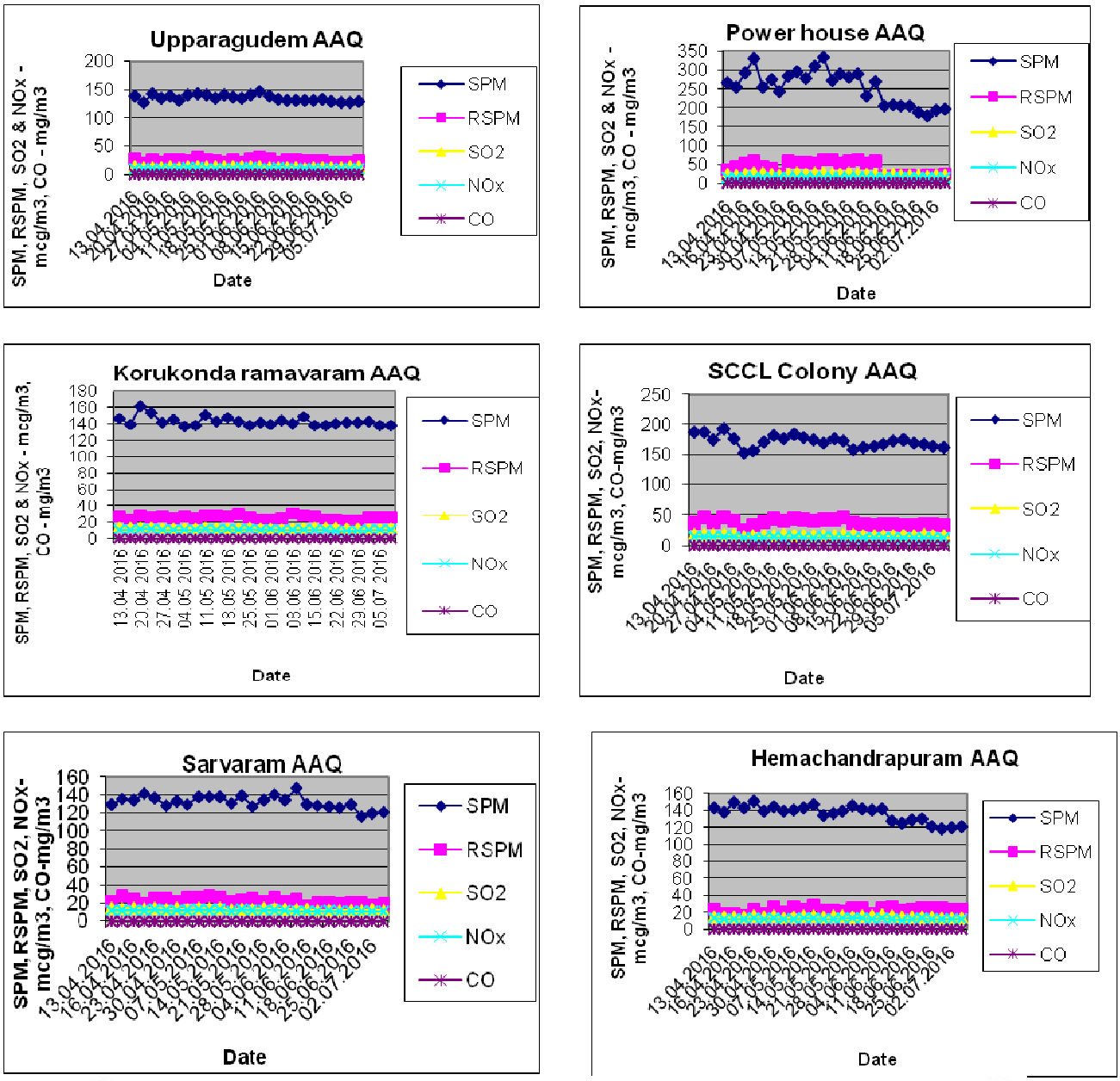
S.No	Elements	Sarvaram	Power House	Korukonda Ramavaram	Hemachandrapm	SCCL colony	Upperagudem
1	Fe	0.80	0.50	0.66	0.15	0.42	0.35
2	Co	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
3	Cu	0.20	0.05	0.06	0.08	0.10	0.10
4	Mn	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
5	Mo	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
6	V	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
7	Sr	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8	Hg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
9	Cd	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
10	As	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
11	Pb	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
12	Cr	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
13	Se	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
14	Zn	1.20	1.10	1.25	1.40	1.55	1.36
15	Ca	0.10	0.05	0.04	0.07	0.45	0.05
16	Mg	0.20	0.07	0.09	0.10	0.05	0.07
17	Na	0.40	0.30	0.15	0.10	0.23	0.20
18	K	0.25	0.12	0.16	0.15	0.10	0.12
19	Al	0.18	0.05	0.07	0.09	0.05	0.10
20	Silica	3.45	1.60	1.20	2.30	1.80	2.0
21	Nickel	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
22	Barium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table 4 Ambient Air analysis Data

No	Location	Date of sampling	SPM ($\mu g/m^3$)	RPM ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (mg/m^3)
Standards			**200.0**	**100.0**	**80.0**	**80.0**	**4.0**
1	**Upparagudem**	13.04.2016	138.5	26.7	13.2	10.7	BDL
2		14.04.2016	127.4	19.2	12.4	10.2	BDL
3		20.04.2016	142.0	25.7	12.5	10.4	BDL
4		21.04.2016	134.7	22.1	12.3	10.6	BDL
5		27.04.2016	138.2	26.5	13.6	10.5	BDL
6		28.04.2016	130.6	25.7	12.9	10.4	BDL
7		04.05.2016	141.1	23.1	13.9	11.1	BDL
8		05.05.2016	142.2	28.5	13.7	11.3	BDL
9		11.05.2016	139.5	25.8	13.5	10.6	BDL
10		12.05.2016	134.0	24.2	13.2	10.3	BDL
11		18.05.2016	141.3	22.4	13.4	10.4	BDL
12		19.05.2016	137.4	24.5	13.3	10.6	BDL
13		25.05.2016	134.4	21.8	14.0	11.6	BDL
14		26.05.2016	139.6	26.7	13.6	11.3	BDL
15		01.06.2016	145.5	29.3	13.3	10.7	BDL
16		02.06.2016	139.1	27.1	12.4	10.8	BDL
17		08.06.2016	132.2	22.4	12.6	11.3	BDL
18		09.06.2016	131.5	25.6	11.5	10.6	BDL
19		15.06.2016	130.0	24.4	11.7	10.5	BDL
20		16.06.2016	131.5	23.3	10.3	9.6	BDL
21		22.06.2016	131.6	24.4	12.3	9.9	BDL
22		23.06.2016	132.3	23.5	11.0	9.4	BDL
23		29.06.2016	128.2	22.7	11.4	10.5	BDL
24		30.06.2016	127.4	22.2	12.7	10.8	BDL
25		05.07.2016	126.1	21.4	13.7	10.3	BDL
26		06.07.2016	128.3	22.6	13.6	10.3	BDL
	B Power House						
Standards			**500.0**	**150.0**	**120.0**	**120.0**	**10.0**
1		13.04.2016	267.3	37.0	25.6	16.5	0.6
2		14.04.2016	253.4	43.7	22.2	16.2	0.5
3		16.04.2016	292.1	54.4	24.7	16.4	0.3
4		17.04.2016	329.2	58.7	26.2	16.7	0.5
5		23.04.2016	254.0	44.2	28.3	16.9	0.6
6		24.04.2016	274.8	39.5	25.5	16.4	0.7
7		30.04.2016	242.9	23.6	21.2	15.7	0.9
8		01.05.2016	283.2	58.8	24.3	16.5	0.4
9		07.05.2016	296.5	56.9	26.7	16.6	0.6
10		08.05.2016	279.6	57.8	25.4	15.5	0.4
11		14.05.2016	309.4	54.1	27.6	16.4	0.5
12		15.05.2016	332.1	63.9	27.8	17.3	0.6
13		21.05.2016	273.1	62.1	24.6	15.5	0.5
14		22.05.2016	288.2	54.5	25.3	16.3	0.7
15		28.05.2016	281.7	58.6	26.5	16.4	0.4
16		29.05.2016	290.9	62.4	25.5	16.3	0.3
17		04.06.2016	232.3	54.9	23.6	15.7	0.2
18		05.06.2016	270.4	59.3	25.3	16.2	0.9
19		11.06.2016	206.3	17.7	24.2	15.8	0.8
20		12.06.2016	208.7	19.5	23.5	15.4	0.5
21		18.06.2016	206.4	20.3	22.6	15.6	0.4
22		19.06.2016	204.5	21.7	21.4	15.5	0.5
23		25.06.2016	186.7	19.5	20.5	14.9	0.6
24		26.06.2016	180.4	22.6	20.3	14.5	0.4
25		02.07.2016	192.5	20.6	22.9	15.4	0.5
26		03.07.2016	195.3	23.1	21.4	15.3	0.7
Korukonda Ramavaram							
Standards			**200.0**	**100.0**	**80.0**	**80.0**	**4.0**
1		13.04.2016	146.5	26.6	13.4	11.1	BDL
2		14.04.2016	139.1	24.1	13.9	10.3	BDL

No	Location	Date of sampling	SPM ($\mu g/m^3$)	RPM ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (mg/m^3)
3		20.04.2016	161.4	27.7	13.3	11.6	BDL
4		21.04.2016	153.2	26.3	13.5	11.5	BDL
5		27.04.2016	141.8	26.4	12.7	10.9	BDL
6		28.04.2016	145.3	25.5	13.3	11.1	BDL
7		04.05.2016	136.5	26.9	12.7	10.4	BDL
8		05.05.2016	138.3	24.7	12.3	10.3	BDL
9		11.05.2016	151.1	27.4	13.9	11.4	BDL
10		12.05.2016	142.5	28.3	12.3	10.7	BDL
11		18.05.2016	147.5	26.7	13.5	11.3	BDL
12		19.05.2016	142.7	29.4	12.2	10.6	BDL
13		25.05.2016	138.5	25.8	13.8	11.8	BDL
14		26.05.2016	141.7	23.2	12.9	10.9	BDL
15		01.06.2016	139.4	23.5	12.2	11.4	BDL
16		02.06.2016	143.5	24.5	12.5	10.6	BDL
17		08.06.2016	139.9	30.3	12.3	10.4	BDL
18		09.06.2016	148.4	28.5	13.3	10.5	BDL
19		15.06.2016	138.9	26.3	13.4	10.3	BDL
20		16.06.2016	137.3	23.2	13.7	10.6	BDL
21		22.06.2016	140.1	23.4	13.3	9.9	BDL
22		23.06.2016	141.4	22.5	12.5	9.4	BDL
23		29.06.2016	141.9	22.2	12.1	9.5	BDL
24		30.06.2016	142.3	25.7	11.7	10.3	BDL
25		05.07.2016	138.6	25.4	11.5	10.6	BDL
26		06.07.2016	138.1	26.5	12.8	10.4	BDL
	Sccl Colony						
Standards			**200.0**	**100.0**	**80.0**	**80.0**	**10.0**
1		13.04.2016	187.3	37.3	18.4	15.3	BDL
2		14.04.2016	186.2	45.7	18.6	14.5	BDL
3		20.04.2016	174.7	38.6	18.3	14.3	BDL
4		21.04.2016	192.3	45.7	18.7	14.7	BDL
5		27.04.2016	176.4	40.3	17.4	14.1	BDL
6		28.04.2016	153.3	25.9	15.5	13.5	BDL
7		04.05.2016	153.6	32.8	15.6	13.7	BDL
8		05.05.2016	170.4	38.2	16.7	13.9	BDL
9		11.05.2016	180.8	44.5	17.3	14.3	BDL
10		12.05.2016	176.5	40.7	17.9	13.8	BDL
11		18.05.2016	182.4	43.9	17.4	14.3	BDL
12		19.05.2016	178.6	42.4	17.1	13.9	BDL
13		25.05.2016	173.4	40.5	16.9	13.6	BDL
14		26.05.2016	169.3	41.6	17.3	14.1	BDL
15		01.06.2016	175.4	41.4	17.6	13.5	BDL
16		02.06.2016	172.7	45.3	18.2	13.4	BDL
17		08.06.2016	157.9	36.3	18.3	12.7	BDL
18		09.06.2016	162.4	35.4	17.6	12.5	BDL
19		15.06.2016	163.6	33.5	17.5	12.9	BDL
20		16.06.2016	166.5	34.7	17.3	12.4	BDL
21		22.06.2016	173.4	34.3	16.6	13.3	BDL
22		23.06.2016	174.3	33.6	16.4	13.7	BDL
23		29.06.2016	168.6	33.7	17.3	13.5	BDL
24		30.06.2016	167.3	34.3	17.6	13.3	BDL
25		05.07.2016	163.2	34.7	16.5	13.6	BDL
26		06.07.2016	161.7	33.4	16.2	13.5	BDL
	Sarvaram Village						
Standards			**200.0**	**100.0**	**80.0**	**80.0**	**4.0**
1		13.04.2016	129.6	22.1	14.9	12.2	BDL
2		14.04.2016	135.3	28.5	14.5	12.5	BDL
3		16.04.2016	133.7	24.3	14.7	12.6	BDL
4		17.04.2016	141.5	19.8	14.3	12.3	BDL
5		23.04.2016	136.6	25.7	14.5	12.9	BDL
6		24.04.2016	127.7	25.4	13.1	11.6	BDL
7		30.04.2016	133.3	21.7	14.5	12.3	BDL

No	Location	Date of sampling	SPM ($\mu g/m^3$)	RPM ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (mg/m^3)
8		01.05.2016	129.5	26.5	13.3	12.1	BDL
9		07.05.2016	138.3	26.7	14.9	12.5	BDL
10		08.05.2016	137.7	27.1	14.3	12.7	BDL
11		14.05.2016	137.4	26.5	14.5	12.3	BDL
12		15.05.2016	129.7	22.3	12.6	11.7	BDL
13		21.05.2016	139.5	23.1	13.5	12.9	BDL
14		22.05.2016	126.6	25.6	13.3	12.3	BDL
15		28.05.2016	134.3	21.8	14.5	12.9	BDL
16		29.05.2016	140.7	26.7	13.6	12.3	BDL
17		04.06.2016	134.3	22.1	13.3	11.6	BDL
18		05.06.2016	147.7	23.4	13.5	11.5	BDL
19		11.06.2016	129.4	16.5	12.3	10.4	BDL
20		12.06.2016	127.9	20.3	12.7	11.3	BDL
21		18.06.2016	126.3	20.5	12.1	11.9	BDL
22		19.06.2016	125.6	19.9	11.6	11.5	BDL
23		25.06.2016	128.3	20.8	12.3	10.7	BDL
24		26.06.2016	115.6	20.4	12.7	10.5	BDL
25		02.07.2016	119.7	18.3	12.2	10.4	BDL
26		03.07.2016	120.6	18.8	12.1	10.9	BDL
	Hemachandrapuram						
Standards			200.1	100.1	80.1	80.1	4.0
1		13.04.2016	142.3	23.3	12.8	12.8	BDL
2		14.04.2016	137.2	14.3	12.1	12.1	BDL
3		16.04.2016	148.5	14.9	12.4	12.4	BDL
4		17.04.2016	143.0	16.4	15.1	12.6	BDL
5		23.04.2016	149.4	23.8	15.4	13.2	BDL
6		24.04.2016	138.5	19.0	14.1	11.6	BDL
7		30.04.2016	143.6	26.3	15.3	13.1	BDL
8		01.05.2016	138.8	23.3	14.1	11.7	BDL
9		07.05.2016	140.4	28.5	14.3	12.4	BDL
10		08.05.2016	142.1	21.8	15.6	13.1	BDL
11		14.05.2016	146.3	22.2	15.8	13.3	BDL
12		15.05.2016	133.5	21.3	15.1	11.5	BDL
13		21.05.2016	136.6	25.0	15.7	12.4	BDL
14		22.05.2016	139.1	25.4	16.2	12.7	BDL
15		28.05.2016	145.2	19.0	15.1	13.1	BDL
16		29.05.2016	141.6	24.7	15.3	13.0	BDL
17		04.06.2016	140.8	25.6	16.2	12.5	BDL
18		05.06.2016	140.3	22.2	16.9	12.7	BDL
19		11.06.2016	127.0	23.1	15.7	11.8	BDL
20		12.06.2016	124.2	24.4	15.0	11.3	BDL
21		18.06.2016	128.4	25.5	14.2	12.4	BDL
22		19.06.2016	129.5	24.4	14.7	12.8	BDL
23		25.06.2016	120.3	25.5	14.5	12.2	BDL
24		26.06.2016	118.4	24.7	13.4	12.5	BDL
25		02.07.2016	119.5	23.1	13.7	11.5	BDL
26		03.07.2016	120.0	23.4	13.4	11.7	BDL



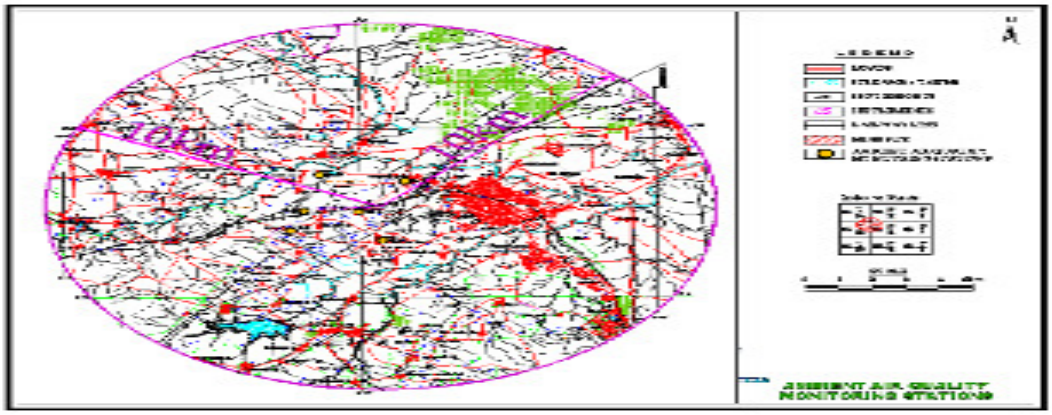


Figure 1 Stations with Graphical Representation of AAQ and Ambient Air Quality Monitoring Stations

CO values are observed less than 1 ppm during study period.. As per the above analysis the max value has been identified at A-5 located at B Power House and the min value has been identified at A-4 located at Sarvaram Village.

Table 5 Summary of Ambient Air Quality ($\mu g/m^3$)

CODE NO	LOCATION NAME	MAXIMUM VALUES				MINIMUM VALUES			
		SPM	RPM	SO_2	NOx	SPM	RPM	SO_2	NOx
A-1	Korukondaramavaram village	161.4	30.3	13.9	11.8	136.5	22.2	11.5	9.4
A-2	SCCL colony	192.3	45.7	18.7	15.3	153.3	25.9	15.5	12.4
A-3	Hemachandrapuram Village	149.4	28.5	16.9	13.3	118.4	14.3	14.3	11.3
A-4	Sarvaram Village	147.7	28.5	14.9	12.9	115.6	16.5	11.6	10.4
A5	B Power House	332.1	63.9	28.3	17.3	180.4	17.7	20.3	14.5
A-6	Upperagudem Village	145.5	29.3	14.0	11.6	126.1	19.2	10.3	9.4
CODE NO	LOCATION NAME	MAXIMUM VALUES				MINIMUM VALUES			
		SPM	RPM	SO_2	NOx	SPM	RPM	SO_2	NOx
A-1	Korukondaramavaram village	161.4	30.3	13.9	11.8	136.5	22.2	11.5	9.4
A-2	SCCL colony	192.3	45.7	18.7	15.3	153.3	25.9	15.5	12.4
A-3	Hemachandrapuram Village	149.4	28.5	16.9	13.3	118.4	14.3	14.3	11.3
A-4	Sarvaram Village	147.7	28.5	14.9	12.9	115.6	16.5	11.6	10.4
A5	B Power House	332.1	63.9	28.3	17.3	180.4	17.7	20.3	14.5
A-6	Upperagudem Village	145.5	29.3	14.0	11.6	126.1	19.2	10.3	9.4

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